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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/033,785	01/03/2002	Jeffrey B. Casady	2343-137-27	8552

7590

12/18/2002

Supervisor, Patent Prosecution Services  
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EXAMINER

IM, JUNGHWA M

ART UNIT	PAPER NUMBER
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2811

DATE MAILED: 12/18/2002

9

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/033,785

Applicant(s)

CASADY ET AL.

Examiner

Junghwa M. Im

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 September 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-37 is/are pending in the application.
- 4a) Of the above claim(s) 20-37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-19 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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## **DETAILED ACTION**

### ***Election/Restrictions***

Applicant's election with traverse of claims 1-19 in Paper No. 7 is acknowledged. The traversal is on the ground(s) that additional examination of a process claims should not be a burden.

This is not found persuasive. As stated previously, instant invention contains the claims regarding to a device and a process, thus having two distinctive classes. Note that examining the claims with two distinctive classes requires two different approaches for search, resulting in an added burden to Examiner.

The requirement is still deemed proper and is therefore made FINAL.

### ***Claim Objections***

Claims 17 and 18 are objected to because of the following informalities.

Claims recite, "...the at least a second ..." which does not have a clear meaning.

Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

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Claims 9 and 10 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims recite that the semi-insulating silicon carbide layer comprises 6H or 4H silicon carbide. However, it is recited that the substrate comprises 6H or 4H throughout the specification, for example on page 6, line 10.

*Claim Rejections - 35 USC § 102*

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

Claims 1, 2, 11-14 and 16-19 are rejected under 35 U.S.C. 102(e) as being anticipated by Ajit (U.S. Pat. No. 6,310,385).

Regarding claim 1, Ajit shows in Fig. 1 a microelectronic device comprising:

a substrate 50;

a semi-insulating silicon carbide layer 40 formed on the substrate (col. 3, lines 6-11); and

a first semiconductor device 20 or 10 formed on the semi-insulating silicon carbide layer.

Regarding claim 2, Ajit shows in Fig. 1 the semi-insulating silicon carbide layer 40 is formed epitaxially.

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In addition, note that “epitaxial growth” is a process designation and would not carry patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

Regarding claim 11, Ajit teaches the first semiconductor device comprises silicon carbide.

Note that the first semiconductor device is built on the SiC semi-insulating layer.

Regarding claim 12, Ajit teaches the first semiconductor device comprises a metal-oxide-semiconductor field effect transistor 20, CMOS.

Regarding claim 13, Ajit teaches the first semiconductor device comprises a lateral metal-oxide-semiconductor field effect transistor 20 (col. 2, lines 39-40).

Regarding claim 14, Ajit teaches the first semiconductor device comprises a bipolar junction transistor 10, IGBT (Insulated Gate Bipolar Transistor).

Regarding claim 16, Ajit shows in Fig. 4 the device further comprising at least a second semiconductor device 60.

Regarding claim 17, Ajit shows in Fig. 4 the second semiconductor device 60 is found on a portion of the substrate 150 that is physically isolated from the first semiconductor device 20.

Regarding claims 18, Ajit teaches in Fig. 4, the second semiconductor device 60 is found on a portion of the substrate 150 that is electrically isolated from the first semiconductor device 20.

Regarding claims 19, Ajit teaches the first semiconductor device is formed epitaxially.

In addition, note that “epitaxial growth” is a process designation and would not carry

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patentable weight in this claim drawn to a product. See *In re Thorp*, 227 USPQ 964 (Fed. Cir. 1985).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3, 5, 7-10 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajit in view of Palmour (U.S. Pat. No. 5,270,554).

Claims 1 and 2 have been discussed previously.

Regarding claim 3, Ajit shows most aspect of the pending claim except that the semi-insulating layer comprises boron.

However, Palmour teaches the semi-insulating layer comprises boron (col. 8, lines 54-58).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Palmour to the device of Ajit in order to have the boron containing semi-insulating layer since boron added semi-insulating layer is desirable to increase the resistivity of the semi-insulating layer resulting in a decrease in the leakage current as taught by Palmour in col. 8, lines 54-58).

Regarding claim 5, Palmour teaches the semiconductor device is a high frequency device (col. 1, line 12).

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Regarding claim 7, Palmour teaches the substrate is a conductor (col. 3, lines 62-63).

Regarding claim 8, Palmour teaches the substrate comprises  $n^+$  silicon carbide (col. 3, lines 62-63).

It would have been obvious that substrate is a conductor since it has a conductivity and the conductivity of the substrate can be either p-type or n-type as taught by Palmour.

Regarding claims 9 and 10, Palmour teaches the semi-insulating silicon carbide layer comprises 6H or 4H silicon carbide (col. 6, lines 3-4).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Palmour to the device of Ajit in order to have 6H or 4H polytypes of SiC layer since such a structure improves the quality of the SiC epitaxial film grown on the substrate.

Regarding claim 15, Palmour teaches the first semiconductor device comprises a junction field effect transistor (col.1, line 33).

It would have been obvious to have a JFET as the first device in place of MOSFET in Ajit since JFET and MOSFET have the similar characteristics of FET device when used as a power device.

### ***Claim Rejections - 35 USC § 103***

Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ajit in view of Barrett et al. (U.S. Pat. No. 5,611,955).

Regarding claim 5, Ajit teaches most aspect of the pending claim except for the semi-insulating layer with a transition metal.

However, Barrett et al. teach that the semi-insulating silicon carbide layer comprises

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transition metal (col. 2, lines 66-67 and col. 3, lines 27-66).

It would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate the teaching of Barrett et al. to the device of Ajit in order to have a transition metal (vanadium) containing SiC layer since vanadium in SiC would create deep level electronic states within the energy gap, thus causing high resistivity (semi-insulation behavior) in SiC as taught by Barrett et al. in col. 3, lines 57-66.


Regarding claim 6, Barrett et al. teaches the semiconductor device is a high power device (col. 1, lines 16-20).

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Junghwa M. Im whose telephone number is (703) 305-3998. The examiner can normally be reached on MON.-FRI. 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tom Thomas can be reached on (703) 308-2772. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

  
Sara Crane  
Primary Examiner